

1 What is claimed is:

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3 1. A spinal support coupling device comprising:

4 first and second radial frames, each pivotably coupled to a center
5 pivot hinge;

6 a traveling arm, coupled to said first and second radial frames at said
7 center pivot hinge, wherein said traveling arm is configured to rotate with respect to
8 said first and second radial frames around said center pivot hinge; and

9 a coupling rod attached to said traveling arm and configured to
10 connect a first and a second surgical screw, placed into a patient, wherein said first
11 and second radial frames are configured to retain corresponding first and second
12 extension rods, extending away from the top of said first and second surgical
13 screws.

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15 2. A spinal support coupling device as claimed in claim 1, further
16 comprising first and second pivot hinge connecting arms coupled to said center
17 pivot hinge and first and second radial frame connecting arms, each coupled to a
18 corresponding one of said pivot hinge connecting arms, and to said corresponding
19 radial frames.

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1 3. A spinal support coupling device as claimed in claim 2, wherein said
2 first and second surgical screws each further maintain a bore hole located at points
3 (P1) and (P2) respectively.

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5 4. A spinal support coupling device as claimed in claim 3, wherein said
6 first and second surgical screws further maintain first and second screw heads
7 respectively.

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9 5. A spinal support coupling device as claimed in claim 4, wherein said
10 first and second extensions rods are coupled to said first and second surgical screws
11 via said first and second screw heads.

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13 6. A spinal support coupling device as claimed in claim 5, wherein said
14 traveling arm is of length (L) and wherein said first and second radial frames are
15 curved such that they lie within an arc defined by a circle with a radius (L).

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17 7. A spinal support coupling device as claimed in claim 6, wherein said
18 first and second radial frames are curved such that the curvature of said radial
19 frames is equal to the curvature of a circle having a radius (L).

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1 8. A spinal support coupling device as claimed in claim 7, wherein first
2 and second radial frames extend along two arcs having a radius of (L), wherein said
3 two arcs intersect at said center pivot hinge.

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5 9. A spinal support coupling device as claimed in claim 8, wherein said
6 first and second radial frames each maintain tracks, configured to span a substantial
7 length of said first and second radial frames.

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9 10. A spinal support coupling device as claimed in claim 9, wherein said
10 spinal support coupling device further maintains first and second sliding retainers,
11 disposed in said tracks of said first and second radial frames respectively.

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13 11. A spinal support coupling device as claimed in claim 10, wherein
14 said first and second sliding retainers each maintain connection bores, configured to
15 receive said first and second extensions rods.

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17 12. A spinal support coupling device as claimed in claim 11, wherein
18 said first and second sliding retainers each maintain a locking mechanism for
19 securing said first and second extension rods within said connection bores.

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1 13. A spinal support coupling device as claimed in claim 12, wherein
2 said first and second sliding retainers are moveably secured in said tracks in a non-
3 rotatable manner.

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5 14. A spinal support coupling device as claimed in claim 13, wherein
6 said first and second screw heads are pivotable, allowing said attached first and
7 second extension rods to move, relative to the longitudinal axes of said first and
8 second surgical screws, so as to facilitate connection with said first and second non-
9 rotatable sliding retainers.

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11 15. A spinal support coupling device as claimed in claim 12, wherein
12 said first and second sliding retainers are moveably secured in said tracks in a
13 rotatable manner such that said connection bores pivot.

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15 16. A spinal support coupling device as claimed in claim 15, wherein
16 said first and second screw heads are fixed in position, maintaining said attached
17 first and second extension rods in the longitudinal axes of said first and second
18 surgical screws, wherein said connection with said first and second sliding retainers
19 is facilitated by the pivoting of said first and second sliding retainers.

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21 17. A spinal support coupling device as claimed in claim 12, wherein
22 said locking mechanisms on said first and second sliding retainers are engaged,

1 when said first and second sliding retainers are at a position along said first and
2 second extension rods, such that the distance between said first sliding retainer and
3 said first screw head at (P1) and said second sliding retainer and said second screw
4 head at (P2) is equal to the length of said traveling arm (L).

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6 18. A spinal support coupling device as claimed in claim 6, wherein said
7 spinal support coupling device further comprises a piercing arm, coupled to the end
8 of said traveling arm, distal to said center pivot hinge.

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10 19. A spinal support coupling device as claimed in claim 18, wherein
11 said piercing arm and said traveling arm are an integrally molded unit.

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13 20. A spinal support coupling device as claimed in claim 18, wherein
14 said piercing arm and said traveling arm are formed as separate units.

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16 21. A spinal support coupling device as claimed in claim 18, wherein
17 said piercing arm is curved such that it lies within an arc defined by a circle with a
18 radius (L).

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20 22. A spinal support coupling device as claimed in claim 21, further
21 comprising a coupling rod, removably attached to the end of said piercing arm.

22

1 23. A spinal support coupling device as claimed in claim 22, wherein
2 said coupling rod is curved such that it lies within an arc defined by a circle with a
3 radius (L).

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5 24. A spinal support coupling device as claimed in claim 22, wherein
6 said coupling rod is configured to be guided by said piercing arm, via said traveling
7 arm, by swinging said traveling arm around said center pivot hinge, such that said
8 coupling rod passes through said first and second bore holes of said first and second
9 surgical screws.

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11 25. A spinal support coupling device as claimed in claim 24, wherein
12 said coupling rod is released from said piercing arm after said coupling rod is in
13 place in said bore holes, and said piercing arm is removed by rotating traveling arm
14 back, away from said surgical screws.

15
16 26. A spinal support coupling device as claimed in claim 24, wherein
17 after said coupling rod is in place it is secured in said bore holes of said first and
18 second surgical screws by tightening said first and second screw heads.

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20 27. A spinal support coupling device as claimed in claim 2, wherein said
21 first and second pivot hinge connecting arms are independently hingedly attached to
22 said center pivot hinge, and are independently movable with respect to one another.

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2 28. A spinal support coupling device as claimed in claim 2, wherein said
3 first and second pivot hinge connecting arms are independently fixedly attached to
4 said center pivot hinge, and are disposed at fixed angles with respect to one another.

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6 29. A spinal support coupling device as claimed in claim 2, wherein said
7 first and second radial frame connecting arms are coupled to said first and second
8 pivot hinge connecting arms, respectively, at points distal to said center pivot hinge.

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10 30. A spinal support coupling device as claimed in claim 29, wherein
11 said first and second radial frame connecting arms are fixedly attached to said first
12 and second pivot hinge connecting arms, respectively, such that they remain at a
13 fixed angle with respect to one another.

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15 31. A spinal support coupling device as claimed in claim 30, wherein
16 said first and second radial frame connecting arms are hingedly attached to said first
17 and second pivot hinge connecting arms, respectively, so as to be freely moveable
18 with respect to one another.

19

20 32. A spinal support coupling device as claimed in claim 30, wherein
21 said first and second radial frame connecting arms fixedly attached to said first and
22 second radial frames at a fixed angle in relation to one another.

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2 33. A spinal support coupling device as claimed in claim 30, wherein
3 said first and second radial frame connecting arms are hingedly attached to said first
4 and second radial frames, and are capable of independent movement with respect to
5 one another.

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7 34. A spinal support coupling device as claimed in claim 2, wherein said
8 first pivot hinge connecting arm, said first radial frame connecting arm and said first
9 radial frame are each hingedly attached to each other as first element and said
10 second pivot hinge connecting arm, said second radial frame connecting arm and
11 said second radial frame are each hingedly attached to each other as second element
12 wherein said first and second elements are independently hingedly attached to said
13 center pivot hinge.

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15 35. A spinal support coupling device as claimed in claim 2, wherein said
16 first pivot hinge connecting arm, said first radial frame connecting arm and said first
17 radial frame are each fixedly attached to each other as a first element and said
18 second pivot hinge connecting arm, said second radial frame connecting arm and
19 said second radial frame are each fixedly attached to each other as a second element
20 wherein said first and second elements are independently hingedly attached to said
21 center pivot hinge.

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1 36. A spinal support coupling device as claimed in claim 2, wherein said
2 first and second pivot hinge connecting arms, said first and second radial frame
3 connecting arms and said first and second radial frames are each fixedly attached to
4 each other as single continuous element, hingedly attached to said center pivot
5 hinge.

6
7 37. A spinal support coupling device as claimed in claim 2, wherein
8 when said first and second radial frames are attached to said first and second
9 extension rods, said first and second pivot hinge connecting arms extend downward
10 such that lines, drawn between said center point at said center pivot hinge to said
11 first and second surgical screw bores at points (P1) and (P2), pass through the
12 longitudinal axes of said first and second pivot hinge connecting arms.

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14 38. A spinal support coupling device, as claimed in claim 1, wherein said
15 device is constructed of any one of surgical grade stainless steel, titanium, rigid
16 polyurethane and plastic.

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18 39. A process for operating a spinal support coupling device, said
19 coupling device maintaining first and second radial frames, pivotably coupled to a
20 center pivot hinge, a traveling arm, coupled to said first and second radial frames at
21 said center pivot hinge, first and second pivot hinge connecting arms coupled to said
22 center pivot hinge, and first and second radial frame connecting arms, each coupled

1 to a corresponding one of said pivot hinge connecting arms on one end, and to said
2 corresponding radial frames on the other end, said method comprising the steps of:
3 inserting said first and second surgical screws, with said first and second
4 extension rods into said patient;
5 attaching the first and second radial frames to said first and second extension
6 arms respectively; and
7 rotating said traveling arm around said center pivot hinge towards said
8 surgical screws to insert a coupling rod, connecting said first and second surgical
9 screws.

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11 40. The process as claimed in claim 68, further comprising the step of
12 locating along said extension rods a point (L) distance away from said surgical
13 screws, wherein (L) is equal to the length of said traveling arm.

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15 41. The process as claimed in claim 69, further comprising the step
16 locking said first and second radial arms in place on said first and second extension
17 rods at point (L).